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opsis of the genus Selaginella in the *Journal of Botany* has reached the 219th species, and is still to be continued.——L. A. Bailey continues his Notes on Carex in the January *Botanical Gazette*, describing one new species, *C. nervina*, and one new variety, *C. muricata*, var. *confixa*, both from the Pacific coast.——Dr. Vasey, in the last *Torrey Bulletin*, describes three new grasses, viz., *Stipa scribneri* from New Mexico, *Festuca confinis* and *Elymus saundersii*, both from Colorado.——In the same journal H. W. Ravenel gives an account of a monster grape-vine in Beaufort county, S. C., which at the ground measures fifty-nine and a half inches in circumference, and "at two and a-half feet from the ground, where it divides into two branches, fifty-seven and a-half inches in circumference."

ENTOMOLOGY.

THE FLIGHT OF THE ROBBER FLIES DURING CONNECTION.—Both fly vigorously though their heads are in opposite directions, the female, by her greater size, controlling the course. The difference in pitch of the two sets of wings is very striking.—*J. E. Todd.*

NOTES ON THE MOUNDS OF THE OCCIDENT ANT.—The mounds built by the *Pogonomyrmex occidentalis* can hardly fail to attract the attention of any observing traveler.

A neatly smoothed bare spot, from three to five feet in diameter is found in the grass and in its center is a mound of quite symmetrical form. This mound is frequently covered entirely with coarse sand or fine gravel, even when the surrounding surface shows little of this material.

It would seem, at first, that the ants, guided by some instinct, selected the material which would best secure their structure from the wind and the rain.

During the past season the writer has found opportunity to test this point. A little watching showed that the excavation below the surface and the building of the mound are carried on by two different sets of workers, one continually bringing out particles from within and dropping them upon the court or bare space around the mound, the other picking up particles from the surface of the court and depositing them upon the mound. The coarseness of the material seems to be determined by the desire of a worker to find as large a particle as he can conveniently carry. For instance, when, as in the case observed, the crust of the ground was broken by the tramping of a horse, medium sized pieces were deposited upon a mound, but none of the smallest and of course none of the largest, as ants have not learned to work otherwise than individually. When particles of broken glass were scattered upon a court they were quickly found and in spite of their angular and polished surface were soon carried and dropped upon the mound. The coarseness and uniformity of the material, therefore, seems readily explained by the principal stated above. Whether the mound shall eventually be formed of gravel depends upon its abundance in the particular locality.—*J. E. Todd.*

NOTES ON THE BREEDING HABITS OF THE LIBELLULIDÆ.—The following observations, though incomplete, are offered because there is no prospect that the writer can pursue the subject farther, at least not for some time.

In the month of July, '82, while camping near Bear creek, Dakota, on a bright, breezy day, his attention was attracted to numbers of dragon-flies hovering over the surface of the water. Many of them were in the usual position when pairing. The male holding the female by the back of the head with his claspers.

From the bottom of a deep clear pool various water-plants came to the surface, and as the water was rippled by the breeze, their tops were occasionally thrown out of the water. Many dragon-flies were noticed hovering about, especially around the tops of these plants; the female evidently endeavoring to gain a footing upon them. In a short time one was successful and immediately folded her wings backward and commenced crawling down the stem into the water. The male meanwhile was forced to let go to prevent his being dragged into the water. I could see the females until they were about a foot below the surface of the water but of course could not trace them to the bottom which must have been at a depth of from three to five feet. They seemed the more conspicuous because of the quantity of air which adhered to their abdomen and wings. After losing his companion the male hovered about, resting occasionally upon the grass at the border of the pool, and evidently watching for the return of the female.

I was unable to determine, very satisfactorily, the length of time which the female remained below the surface, but after the first one observed disappeared below the surface fully half an hour passed before I saw one reappear. This one appeared struggling upon the surface of the water and was quickly seized by one of the males with his claspers. She seemed to have torn her wings so as to be unable to fly, but it may have been that they could not be promptly used on account of being wet. The male after seizing her towed her to shore, being apparently unable to lift her from the water. A male falling accidentally upon the water was not similarly rescued. The water was more or less infested with fish and it seems not improbable that many of these venturesome insects sacrificed their lives in devotion to their progeny.

Other pairs of the same or closely similar species were observed about the edge of the water, the female evidently fastening her eggs to the under-side of sticks and stems of weeds by extending her abdomen below the water while resting upon them. The species was not recognized and conveniences for collecting and preserving were not at hand, but it resembles quite closely another species which has been determined by Dr. Hagen as *Lestes unguiculata*. The latter species, at another locality, was found depositing eggs in the stems of bulrushes and cat-tails, the male accompanying the female in a position similar to that in the first species named. The female saws a hole through the skin with her ovipositor and deposits the egg in the pith. Similar localities have been diligently watched by the writer during the past two seasons, but it has not been his privilege again to see the dragon-flies go below the surfacc of the water. The laying of eggs in the stems of bulrushes is a very common sight about the marshy ponds and streams of Dakota.

The different stages or positions in the process of copulation in the dragon-flies are very interesting and sometimes puzzling, but as a general rule they seem to be as follows:—at least it is so with the genus Lestes. First, the male seizes the female by the back of the head and flies some time with her in this position before the second stage is reached, in which the male, still holding the female, curves his abdomen and charges the seminal sac, then resumes the first position. The female seizes the abdomen of the male with her feet and brings the tip of her abdomen forward and receives the seminal fluid from its receptacle From the third the fourth is readily reached by the female withdrawing her abdomen and letting go with her feet or not as the case may be. In the species of Lestes before referred to the fourth position corresponds to the first. It seems not improbable that after laying a number of eggs the female may return to the second position and become fertilized for a second brood. The length of time which is occupied evidently varies considerably. In some cases I have observed, the males and females united during their rest at night. Another curious habit observed, especially in a large olive-green species of Æschna, is this: while flying at full speed the insect dashes flat upon the surface of the water in a pond and, apparently by the rebound, recovers its position in the air. This may serve the purpose of a bath, clearing the wings of dust, or possibly of parasites.—*J. E. Todd, Tabor, Ia., Jan. 10, '85.*

THE NUMBER OF ABDOMINAL SEGMENTS IN LEPIDOPTEROUS LARVÆ.—In connection with our examination of the caterpiller of Lagoa we have made an examination of the caterpillars of each of the families of Lepidoptera in order to ascertain whether there was any variation in the number of segments to the body and whether there were any more than five pairs of abdominal legs. We find that no caterpillars known to us have less than ten abdominal segments or uromeres. The ninth segment, however, is liable to be much reduced in size and to be more or less coalesced with the tenth or anal segment. The ninth segment is most rudimentary in the Sphinges, where it is very short, though yet distinguishable; beneath, the segment is distinct on the sides, but obsolete in the middle.

In the larval butterflies the ninth segment is rather more distinct than in the Sphinges, but it is short; the tenth segment is as in all caterpillars represented by the supra-anal plate and anal legs.

In the Ægerians, Zygænidæ and Bombycidæ, the latter especially, the ninth segment is very distinct. In Halesidota the ninth segment is quite long, forming an entire segment, with its own set of hair-bearing warts, the urite, or ventral surface is quite distinct from the infra-anal plate or tenth urite. In Datana the ninth segment is longer than the supra-anal plate; in *Lochmœus tessella* with its long anal filaments, the homologues of the anal feet, the ninth segment is distinct from the tenth; in an allied Notodontian with elongated anal legs, the ninth segment is unusually long and distinct. In *Telea polyphemus* there are ten abdominal segments, counting the supra-anal plate and anal legs as the tenth; in *Hyperchiria io* and Clisiocampa the ninth is distinct from the tenth segment

In *Limacodes scapha* and *P. pithecium* there are no traces of legs; the number of abdominal segments appears to be ten.

In the Noctuidæ the ninth segment is distinct, with a series of verticils above and a well marked ventral portion or urite.

In the geometers the ninth segment is distinct above but below merged into the infra-anal plate. In the Pyralid caterpillars, as well as the Tortricids and Tineids, the ninth segment is longer and more distinct than in the higher families.

Although the indications are slight, yet the Bombycidæ, as we have previously remarked, seem to be the oldest, most generalized group of Lepidoptera, and it is a question whether the Pyralids, Tortricids and Tineids are not degenerate forms which have descended fron the Noctuidæ and ultimately from the Bombycidæ; there are indications that the Noctuidæ have descended from the geometers, since the young of the Plusiæ and Catocalæ, &c., have three pairs of abdominal legs, being semi-loopers when hatched, and afterwards acquiring the additional pair of legs. At any rate the primitive caterpillar had ten pairs of abdominal legs.

It will be remembered that the saw-fly larvæ (*Lophyrus*) have eight pairs of abdominal legs, while the embryo honey-bee has tenpairs of temporary abdominal appendages.—*A. S. Packard.*

ENTOMOLOGICAL NOTES.—Studies on the organs of flight in the Hymenoptera, by Dr. Amans, appear in the Travaux de Laboratoire de zoologie de la Faculté des Sciences de Montpellier et de la station Zoologique de Cette, 1884.——In *Psyche* for June–July, 1884, W. C. Krauss describes in detail, with sketches, the brain and nerves of the head and mouth-parts of *Corydalus cornutus.* ——In the *Zoologischer Anzeiger* for Nov. 15, 1884, Dr. J. E. Rombouts discusses the mode of progression of flies on smooth surfaces, and concludes that the fluid by which flies adhere to smooth surfaces is not sticky, that they need no adhesive secretion and that if the fluid were pure water or olive oil it would act the same and that the fly's power of walking on a smooth surface is due simply to capillary attraction. A firm adhesion of the hairs to smooth surfaces, which Hepworth in 1854, and Dahl and Simmermacher consider as necessary, he finds not to exist.——A memoir of great value on the anatomy of a Myriopod (*Lithobius forficatus*), with four colored plates and wood-cuts, but unfortunately wholly in Russian, was published in 1880, by N. Sograff in the Moscow Transactions.——In the Bulletin of the Brooklyn Entomological Society, Nov., 1884, Mr. G. Gabe claims that *Rhyssa lunator* is not a true ichneumon, but a true wood-feeder. The breeding habits are described, and the mode of oviposition. During the process the long ovipositor is bent, passed between the posterior legs, the abdomen is elevated almost to a right angle with the thorax, and the ovipositor, guided by the anterior tarsi is forced with a ramming motion into the wood to the depth of from two or three inches. He has watched many females ovipositing and has cut off the ovipositor when ready to be withdrawn, and in no instance has he found a larva of any kind anywhere near the point reached by the borer, and where the egg was deposited. Messrs. Hulst and Weeks stated that they had reached the same conclusion from independent observation.——During the past winter Prof. Packard has given a series of talks or lectures to the Providence Entomological Society on the structure and habits of insects, in order to aid those members whose time does not permit them to obtain a general knowledge of the subject.——The veteran French Coleopterist, Auguste Chevrolat, died Dec. 16th, in his 86th year.

ZOÖLOGY.

Function of Chlorophyll in Animals.—L. von Graff, dissatisfied with the conclusions of Brandt as to the symbiotic relations of what the latter regards as green algæ to *Hydra viridis*, and with the methods of his experiments, arranged three specimens of *H. viridis* in eight different vessels; four of them, A, B, E and F, he exposed to the light; A, B, C and D were filled with water from an aquarium. In E—G the water was filtered. In A, C, E and G the water was changed daily, in the others it was never changed at all. The first Hydra to die was one in glass G, on the thirty-first day of exposure in which the filtered water was changed daily, and the light shut off. The glass A did not lose a specimen till the 109th day of observation, when one died. In C in which the aquarium water was changed daily, and light shut off, the three specimens died on the 105th, 106th and 109th days; B, in which the water was not changed, and which was ex-